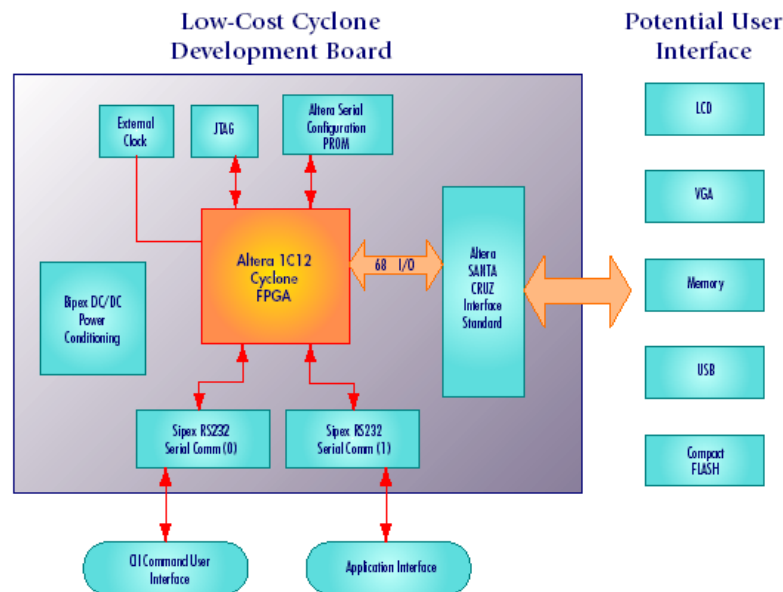


Hardware User Manual: Future Cyclone Badge

Purpose:

This manual is intended to assist the user in verifying the proper operation of their Future Electronics Cyclone Badge board.



Prerequisites:

This procedure references use of utilities that are provided as a result of the installation of Altera's Quartus II 4.1 Web Edition Software Suite, which includes a Nios II OpenCore Plus H/W evaluation. [Note]: The test routine is built with Nios I and is already loaded into the configuration device. No other requisites are needed besides what is included in the kit to verify functionality of the badge board.

Limitations:

The Nios II OpenCore Plus H/W evaluation, included as part of this kit, is execution limited to 176,093,659,136 clock cycles. The Cyclone Badge has a 50MHz clock crystal supplying the clock to the Cyclone FPGA. This particular Nios based design will run continuously for approximately 1 hour untethered (not connected to Quartus II through Byteblaster). Nios II OpenCore Plus H/W evaluation will run an unlimited amount of time in a "tethered" mode. Please keep this in mind when you are testing designs that utilize this evaluation core.

What is the design doing?

SOPC Builder was used to construct a Nios-based Microcontroller. The Nios in this example was configured in SOPC Builder to have 2 UART ports, 2 parallel I/O ports of 3 bits each and one timer. A small 'C' program was written and compiled which uses the Nios resources to perform input and output messages via the UARTs. The user types a character, launching the program which then uses the timer to output a message every second to one of UART ports. At the same time, characters are output via the second UART.

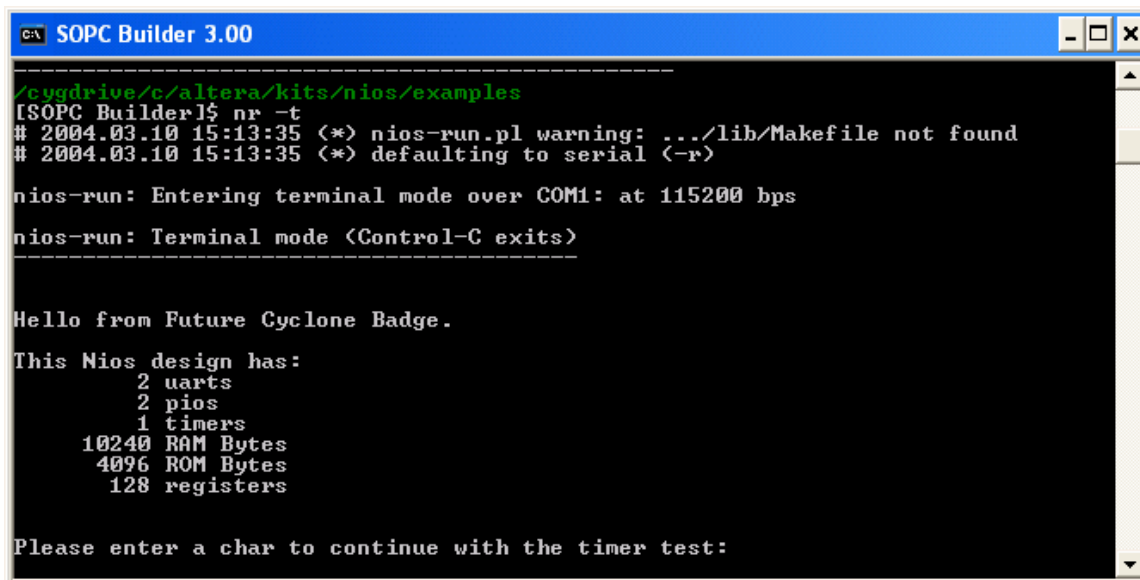
An 8-bit counter is also included in the FPGA hardware design to exercise all of the spare I/O pins that are routed to the boards Santa Cruz connector pins.

The parallel I/O ports are used to interface the 3 user pushbutton switches and led indicators. The switches are ‘ANDed’ inside the FPGA. When any of the user pushbuttons are depressed, LED3 will extinguish. LED1 will flash at an approximate 1Hz rate.

Both the Nios configuration and the compiled ‘C’ program reside in the serial configuration device, so no downloads are required to witness the boards operation.

Here’s what to do...

1. Install Altera tools if needed (Quartus II 4.1, SOPC builder)
2. Open SDK shell (From Tools SOPC Nios II SDK shell)
3. At the shell prompt, type “nr -t” to enter terminal mode
4. Connect the Badge Board serial port labeled “COM1” to serial port of PC using the included serial cable
5. Connect power to badge using the included AC to DC adapter. The following will be displayed in the shell window:



```
C:\ SOPC Builder 3.0

/cygdrive/c/altera/kits/nios/examples
[SOPC Builder1$ nr -t
# 2004.03.10 15:13:35 (*) nios-run.pl warning: ../lib/Makefile not found
# 2004.03.10 15:13:35 (*) defaulting to serial (-r)

nios-run: Entering terminal mode over COM1: at 115200 bps
nios-run: Terminal mode (Control-C exits)

-----

Hello from Future Cyclone Badge.

This Nios design has:
    2 uarts
    2 pios
    1 timers
  10240 RAM Bytes
   4096 ROM Bytes
    128 registers

Please enter a char to continue with the timer test:
```

6. Type a character to start the counter. The Badge Board will echo the character typed and will start counting. LED1 will start blinking once a second. The following will be displayed in the shell window:

```

C:\ SOPC Builder 3.00
Hello from Future Cyclone Badge.

This Nios design has:
    2 uarts
    2 pios
    1 timers
    10240 RAM Bytes
    4096 ROM Bytes
    128 registers

Please enter a char to continue with the timer test:
Your char is: a
A second passed! (0)
A second passed! (1)
A second passed! (2)
A second passed! (3)
A second passed! (4)
A second passed! (5)
A second passed! (6)
A second passed! (7)
A second passed! (8)
A second passed! (9)
A second passed! (10)

```

7. Switch the serial cable on the Badge Board from “COM1” to “COM2”. The alphabet will be output by the Badge Board through the second serial port as shown below:

```

C:\ SOPC Builder 3.00
A second passed! (92)
A second passed! (93)
A second passed! (94)
A second passed! (95)
A second passed! (96)
A second passed! (97)
A second passed! (98)
A second passed! (99)
A second passed! (100)
A second passed! (101)
A second passed! (102)
A second passed! (103)
A second passed! (104)
A second passed! (105)
A second passed! (106)
A second passed! (107)
A second passed! (108)
A second passed! (109)
A second passed! (110)
A second passed! (111)
A second passed! (112)
UmMnNoOpPqQrRsStTuUvUwWxXyYzZ
aAbBcCdDeEfFgGhHiIjJkKlLmMnNoOpPqQrRsStTuUvUwWxXyYzZ
aAbBcCdDeEfFgGhHiIjJkKlLmMnNoOpPqQrRsStTuUvUwWxXyYzZ
aAbBcCdDeEfFgGhHiIjJkKlLmMnNoOpPqQrRsStTuU

```